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October 3, 2013

VIA ELECTRONIC AND CERTIFIED MAIL

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Dear Directors Aronson and Ming:

On behalf of the Center for Biological Diversity (the Center), I am writing to urge you to place an immediate moratorium on new oil and gas approvals involving hydraulic fracturing (fracking) and other unconventional extraction techniques to protect our marine environment and comply with your statutory stewardship duties. This is necessary because fracking and other unconventional techniques increase the environmental damages and risks beyond that of conventional development, and cannot be lawfully authorized without supplemental environmental review pursuant to the National Environmental Policy Act (NEPA) and compliance with other environmental laws. I further request that you suspend fracking and other unconventional oil and gas extraction techniques that may be carried out under existing approvals. This is necessary because these activities pose a threat of serious harm to marine life and the coastal environment and thus should be suspended pursuant to the Outer Continental Shelf Lands Act (OCSLA) and other authorities. The reasons for these requests are set forth fully below.

It has recently come to light that hydraulic fracturing is occurring in offshore drilling operations in the Pacific Region without adequate regulatory oversight and without environmental review required by laws including NEPA and OCSLA. According to federal documents obtained by journalists, federal regulators at the Bureau of Safety and Environmental Enforcement (BSEE) have permitted fracking in federal waters on existing leases in the Pacific

Ocean at least 12 times since the late 1990s, and have recently approved a new project.[1] Records released by the agency indicate that Venoco conducted fracking on the Gail Platform Well E-8 in 2010.[2] More recently, BSEE approved an Application for Permit to Drill (APD) from DCOR to use fracking on Gilda Platform well S-05.[3] An oil industry fact sheet about offshore fracking indicates the process is "[s]imilar to hydraulic fracturing that is being used to develop unconventional resources onshore . . . ."[4] In a recent Associated Press article on offshore fracking, an experienced petroleum engineer was quoted saying that introducing fracking to offshore oil development "no doubt adds complexity and risk."[5] Allowing this hazardous and toxic activity to occur in the delicate offshore environment is reckless and irresponsible. As such, these 12 approvals and others involving fracking in the Pacific Outer Continental Shelf violate multiple environmental laws.

On land, fracking, drilling, and the resulting toxic wastewater have developed an extensive track record of spills, accidents, leaks, pollution, and property damage. The damages from fracking and drilling to air, water, wildlife, and health have been severe, and often irreversible. Yet the full extent of the risks and the long-term impacts are not even fully understood. Hundreds of carcinogenic and toxic chemicals are known to be used in fracking, but the full extent and composure of chemicals used in fracking is undisclosed by the industry. The latest fracking techniques, including the high volume, high-pressure use of the chemical fracking fluid combined with horizontal drilling, have been in use for only about a decade, yet in that time have transformed the oil and gas industry and led to drilling booms around the country by facilitating production from shale formations that could not previously be economically developed. Both the impact on the oil and gas industry and the environmental and community destruction have been dramatic. This experience with onshore fracking, along with the additional factors discussed in detail below, demonstrates that this activity poses a grave and imminent threat when conducted in our oceans.

Accordingly, this letter requests that the Bureaus halt fracking approvals pending environmental compliance, as described fully below.

1. Supplemental Environmental Review of Offshore Fracking Is Required Under the National Environmental Policy Act.

Permits that involve fracking or other unconventional extraction techniques are not undergoing environmental review, which is a prerequisite for informed government decisionmaking. Offshore oil leasing and drilling has four distinct stages: 1) a five-year plan, 2)

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[1] Dearen, Jason and Alice Chang, Offshore Fracking Off California Coast Under Review, Drawing Calls For Increased Regulation (Aug. 3, 2013) ("Dearen 2013") http://www.huffingtonpost.com/2013/08/03/offshore-fracking_n_3700574.html

[2] Venoco, Inc., Application for Permit to Drill submitted to U.S. Department of the Interior Bureau of Safety and Environmental Enforcement (Nov 19, 2009).

[3] DCOR, LLC, Application for Permit to Drill submitted to U.S. Department of the Interior Bureau of Safety and Environmental Enforcement (Apr 27, 2012).

[4] *See* American Petroleum Institute Briefing Paper (2013) *Offshore Hydraulic Fracturing*. Available at: *http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Exploration/Offshore/Offshore-Hydraulic-Fracturing.pdf.*

[5] Dearen 2013.

oil and gas lease sales, 3) exploration, and 4) development and production. *See Sec'y of the Interior v. California*, 464 U.S. 312, 337 (1984). At each stage, the agency must comply with NEPA. *See Village of False Pass v. Clark*, 733 F.2d 605, 609 (9th Cir. 1984). To drill production wells, a company must first submit for approval a development and production plan and BOEM must approve the plan. *See* 30 C.F.R. § 550.201. After a production plan is approved, the company must additionally submit an Application for Permit to Drill (APD) and have BSEE approve it. 30 C.F.R. § 250.410. Here, the Center has obtained APDs that include fracking. It appears that the decisions to approve these APDs were not the subject of a site-specific NEPA analysis that included discussion of the impacts of fracking or other unconventional extraction techniques.

NEPA is "our basic national charter for protection of the environment." 40 C.F.R. § 1500.1(a). NEPA's twin aims are to ensure that federal agencies consider the environmental impacts of their proposed actions and to ensure that agencies inform the public that environmental concerns have been considered. NEPA requires "responsible [federal] officials" to prepare an environmental impact statement (EIS) to consider the effects of each "major Federal action[ ] significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C)(i). The scope of this requirement is "exceptionally broad," *Found. for N. Am. Wild Sheep v. United States Dep't of Agric.*, 681 F.2d 1172, 1177 (9th Cir. 1982), and it is intended to "compel agencies . . . to take seriously the potential environmental consequences of a proposed action." *Ocean Advocates v. United States Army Corps of Eng'rs*, 402 F.3d 846, 864 (9th Cir. 2005). "'[A]n EIS must be prepared if substantial questions are raised as to whether a project . . . may cause significant degradation of some human environmental factor.'" *Idaho Sporting Cong. v. Thomas*, 137 F.3d 1146, 1149 (9th Cir. 1998) (citation omitted) (emphasis in original).

Under NEPA, agencies must not only perform EISs prior to taking federal action, but agencies must perform *supplemental* review whenever "[t]here are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." 40 C.F.R. § 1502.9(c)(1). As described fully below, fracking and other unconventional extraction techniques bring environmental damages and risks beyond those of conventional development. Because fracking and other unconventional techniques do not appear to have been considered in previous NEPA documents prepared by the Bureaus for offshore oil and gas approvals, and because the Bureaus have not otherwise conducted any adequate NEPA review of fracking and other unconventional techniques, supplemental environmental review is clearly required.

Foremost, APDs involving fracking without environment review of those practices are in violation of NEPA. To the extent that the Bureaus rely on historical NEPA review, such reliance is inadequate to fulfill the agencies' statutory duties in light of new information. The introduction of the latest fracking methods and other unconventional extraction techniques is a significant new circumstance bearing on the environmental impact of offshore oil development. Thus, even if previous NEPA documents examined plans for the wells where fracking is occurring offshore, these analyses must be supplemented to consider the impact of fracking and other unconventional techniques.[6] The only NEPA documents that could support a decision to allow

[6] The most recent publically available NEPA analysis of a development and production plan in the Pacific Region is the 2013 BOEM Environmental Assessment (EA) for Revisions to the Hildago Platform Development and

fracking offshore would have been prepared many years ago before the latest techniques like fracking came into use. Accordingly, even if the Bureaus could otherwise have relied upon older EISs for their decisions regarding APDs, the introduction of fracking offshore requires a supplemental EIS.

Instructive here, a federal court recently held that the Bureau of Land Management violated NEPA by leasing onshore mineral rights for oil and gas development without an adequate review of the risks of fracking,[7] and we believe that offshore permit approvals suffer from the same legal deficiency.

a. Significant new information and circumstances demonstrate that fracking intensifies environmental damage beyond that previously analyzed.

The advent and use of the latest fracking and other unconventional techniques have significantly increased the damage and risk beyond that brought by conventional development, triggering the need for supplemental NEPA analysis. *See* 40 C.F.R. § 1502.9(c)(1). These significant new circumstances and information include (i) increased intensity and duration of oil and gas operations; (ii) use of toxic chemicals and increased water pollution; (iii) additional air pollution impacts; (iv) great impacts on wildlife from vessel traffic and lighting; and (v) additional seismic risks, all of which are discussed below.

i. Fracking and other unconventional techniques increase the amount and duration of drilling beyond that previously contemplated.

Fracking and other unconventional extraction techniques not only bring new risks but also increases the damage from oil and gas drilling because they allow the development of areas that were previously uneconomical to develop, and allows continued production from wells that might otherwise be retired.[8] The scale of this threat should not be underestimated: California's Monterey Shale, which extends offshore, holds an estimated 15.4 billion barrels of shale oil, or 64 percent of the nation's total shale oil resources, according to the U.S. Energy Information Administration.[9] At a time when most of the Pacific Outer Continental Shelf is under a moratorium for new oil and gas leasing, fracking makes it likely that those areas under leases will be more intensively developed, bringing associated environmental impacts that require analysis.

Negative impacts are also likely to arise from the stress on aging infrastructure. Longer lifetimes for old wells and high pressures from fracking increases the risk of failures of pipelines,

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Production Plan. This EA tiers to a 1984 EIS. The EA contains no analysis of fracking and the 1984 EIS could not have contained any discussion of the latest fracking techniques, which have only been in use more recently.

[7] *Center for Biological Diversity v. BLM,* 2013 U.S. Dist. LEXIS 52432, 1-2 (N.D. Cal. 2013).

[8] *See, e.g.*, Citi Investment, Research and Analysis (2012) *Resurging North American Oil Production and the Death of the Peak Oil Hypothesis* at 9 ("CITI"); U.S. Energy Information Administration (2011) *Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays* at 4 ("USEIA 2011"); Orszag, Peter (2011) *Fracking Boom Could Finally Cap Myth of Peak Oil,* Bloomberg (Jan 31, 2012).

[9] USEIA 2011.

well control, or other equipment that may result in risks to human and environmental safety. Thus, the threatened environmental damage from drilling on existing leases is greater today than previously understood at the time the leases, exploration and development and production plans were approved. Offshore fracking and other unconventional production techniques have received no meaningful updated environmental analysis. Consequently, the impact of extending the life of aging oil and gas wells and likely increased interest in drilling offshore in the Pacific increases the safety and environmental risks of oil and gas development off California's coast.

ii. Fracking uses toxic chemicals and increases risks to water quality.

Oil and gas activities in general are significant threats to water quality in large part because the waste these operations produce is highly hazardous, containing many known carcinogens, like benzene. Solid and fluid oil exploration wastes can generally be placed into three categories: produced water, drilling fluids and cuttings, and associated wastes.[10] Produced water can contain harmful substances like benzene, arsenic, lead, hexavalent chromium, barium, chloride, sodium, sulfates, and boron,[11] and it also can be radioactive.[12]

Water contamination is a particular hazard with fracking because hundreds of toxic chemicals are used in fracking fluid. While the oil and gas industry has to date successfully resisted the full disclosure of fracking chemicals, what is known is cause for extreme concern.[13] Harmful chemicals present in these fluids can include volatile organic compounds (VOCs), such as benzene, toluene, xylenes, and acetone.[14] A congressional report sampling incomplete industry self-reports found that "[t]he oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act."[15] One peer-reviewed scientific study examined a list of 944 fracking fluid products containing 632 chemicals, 353 of which could be identified with Chemical Abstract Service numbers.[16] The study concluded that more than 75 percent of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems; approximately 40 to 50 percent could affect the brain/nervous system, immune, and cardiovascular systems, and the kidneys; 37 percent could affect the

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[10] Mall, Amy (2010) *Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy* at 7.
[11] *Id.* at 8.
[12] *See* E&E news staff writer, Proposed law would force drillers to test waste for radiation, E&E News Energywire (Feb 14, 2013)
[13] *See, e.g.,* United States House of Representatives, Committee on Energy and Commerce Minority Staff (2011) *Chemicals used in hydraulic fracturing* ("House Report") at 11-12; *see also* Colborn, Theo et al. (2011) Natural gas operations from a public health perspective. *Human and Ecological Risk Assessment* 17:1039 ("Colborn 2011"); McKenzie, Lisa et al. (2012) Human health risk assessment of air emissions form development of unconventional natural gas resources, *Sci Total Environ* doi:10.1016/j.scitotenv.2012.02.018 ("McKenzie 2012").
[14] United States Environmental Protection Agency (2011) *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources.*
[15] House Report at 8.
[16] Colborn 2011 at 1.

endocrine system; and 25 percent could cause cancer and mutations.[17] Another study reviewed exposures to fracking chemicals from onshore wells and noted that trimethylbenzenes are among the largest contributors to non-cancer threats for people living within a half mile of a well, while benzene is the largest contributor to cumulative cancer risk for people, regardless of the distance from the wells.[18] Another recent study has found increased arsenic and heavy metals in groundwater near fracking sites in Texas.[19]

The South Coast Air Quality Management District ("SCAQMD") has recently adopted disclosure rules for unconventional oil and gas development in the Los Angeles basin.[20] An analysis of the first 30 days of operations for which reporting was required revealed that operators used dozens of chemicals known to be air toxics hundreds of times in the first month of reporting alone.[21]

Toxic chemicals that enter the marine environment will impact marine life and sensitive habitats. California has many species of whales, porpoises, dolphins, pinnipeds, and sea otters. More than 500 species of fish live off the shores of southern California. The coastal waters off California are a productive foraging region for whales and sea turtles and support a myriad of wildlife.

While the impacts to wildlife have received little study, these chemicals clearly pose a threat to marine life.[22] Releases of fracking fluids onshore have led to fish kills in freshwater bodies.[23] During fracking, a significant amount of the fracking fluid returns to the surface and in the offshore context is either discharged into the ocean or transported for onshore ground injection. When disposed at sea, these chemicals enter the marine ecosystem. And on land, underground injection of fracking fluids has the potential to contaminate groundwater. Spilling or leaking of fracking fluids, flowback, or produced water is also a huge problem. Spills can occur at the surface, and there is a risk of underground migration of fluids. Also, many fluids must be transported to and/or from the well, presenting additional opportunities for spills.

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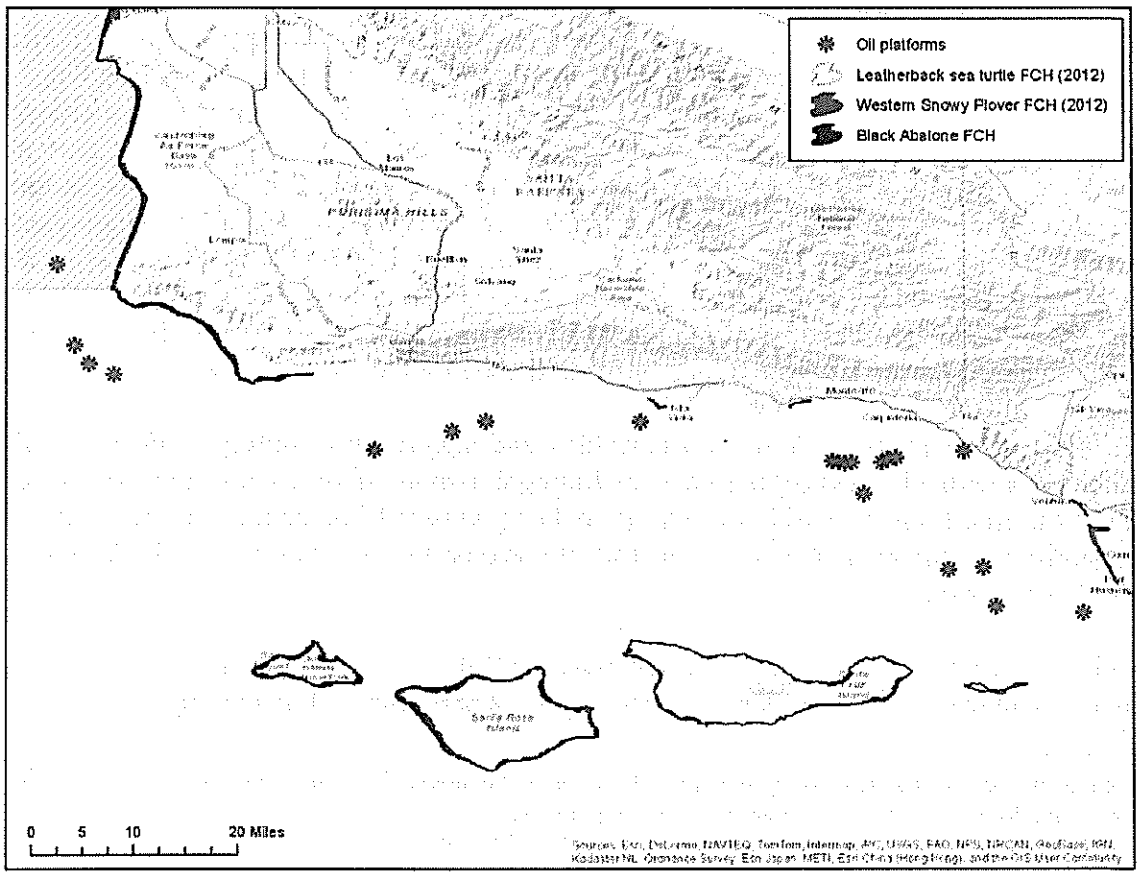
[17] Colborn 2011 at 1.
[18] McKenzie 2012 at 5.
[19] Fontenot, Brian et al., An evaluation of water quality in private drinking water wells near natural gas extraction sites in the Barnett Shale Formation, Environ. Sco. Technol., DOI: 10.1021/es4011724 (published online July 25, 2013); U.S. Government Accountability Office, Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks, GAO 12-732 (September 2012).
[20] South Coast Air Quality Management District, Rule 1148.2 Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers, Adopted April 5, 2013 ("SCAQMD Revised Draft Staff Report PR1148-2").
[21] Center for Biological Diversity, *The Dirty Dozen: The 12 Most Commonly Used Air Toxics in Unconventional Oil Development in the Los Angeles Basin* (Sept. 5, 2013), available at http://www.biologicaldiversity.org/news/press_releases/2013/los-angeles-air-toxics-09-05-2013.html
[22] *See* Bamberger, M. and Oswald, R.E. (2012) Impacts of gas drilling on human and animal health. *New Solutions*, 22(1):51-77; Betsey Piette (2012) BP oil spill, fracking cause wildlife abnormalities, *Workers World*, April 27; Pennsylvania Fish and Boat Commission (2012) Ongoing problems with the Susquehanna River smallmouth bass, A case for impairment, available at http://www.fish.state.pa.us/newsreleases/2012press/senate_susq/SMB_ConservationIssuesForum_Lycoming.pdf (last visited August 20, 2013).
[23] *See* Papoulias, Diana M. and Velasco, Anthony L. (2013) Histopathological analysis of fish from Acorn Fork Creek, Kentucky, exposed to hydraulic fracturing fluid releases. *Southeastern Naturalist*, 12:92-111; MIT Energy Initiative (2011) *The future of Natural Gas, An Interdisciplinary MIT study*.available at: http://web.mit.edu/mitei/research/studies/natural-gas-2011.shtml (last visited August 19, 2013).

Water pollution from oil and gas drilling exacerbated by fracking will harm sensitive habitat, including important habitats for threatened and endangered species. Blue, fin, sei, humpback, and sperm whales, as well as other marine mammals like sea otters, use southern California seawaters. Endangered leatherback, loggerhead, green, and olive ridley sea turtles also occur in this area. Endangered white and black abalone are found in the intertidal areas. Protected fish, including the tidewater goby and southern California steelhead population, are in the area. Threatened and endangered sea birds including the California least tern, western snowy plover, and light-footed clapper rail are also present in the project area. The beach spectacle-pod, which is a California threatened species, may also be present in the area. There is designated critical habitat for black abalone, leatherback sea turtles, and snowy plovers in the vicinity of California's offshore oil platforms (see map below). These biologically sensitive and important habitat areas will be significantly impacted by water pollution associated with fracking and other unconventional techniques.



Thus fracking chemicals, acidization chemicals, and produced waters will increase the waste generated from oil and gas drilling with subsequent increases in pollution and potential for spills. Using fracking to increase the lifecycle of an oil or gas well also means a longer life for the impacts of the operation including ongoing waste discharges, oil spills, and other spills into the ocean that can harm marine life.

iii. Fracking increases air pollution.

In addition to water contamination, fracking and associated practices also increase air pollution and exacerbate climate change. Fracking does not occur in isolation, but brings with it all of the air pollution sources from conventional drilling and development, as well as introducing new sources of air pollution.

Oil and gas operations emit numerous air pollutants, including volatile organic compounds ("VOCs"), nitrogen oxides ("NO_X"),[24] non-methane hydrocarbons ("NMHCs"), particulate matter ("PM"), hydrogen sulfide, and methane. VOC emissions, which make up about 3.5 percent of the gases emitted by oil or gas operations,[25] are particularly hazardous.[26] VOC emissions include the BTEX compounds – benzene, toluene, ethyl benzene, and xylene – which are Hazardous Air Pollutants.[27] Health effects associated with benzene include "acute and chronic nonlymphocytic leukemia, acute myeloid leukemia, chronic lymphocytic leukemia, anemia, and other blood disorders and immunological effects."[28] Further, maternal exposure to benzene has been associated with an increase in birth prevalence of neural tube defects. Xylene exposure also can cause eye, nose, and throat irritation, difficulty in breathing, impaired lung function, and nervous system impairment.[29] In fact, many of the volatile chemicals associated with drilling and oil and gas waste are associated with serious effects to the respiratory, nervous, or circulatory systems.[30] Also, a recent study sampling air quality near Colorado gas wells found additional cause for concern regarding VOC emissions: among other things, it found methylene chloride in high concentrations.[31] The study states that for the wells tested "[m]ethylene chloride, a toxic solvent not reported in products used in drilling or hydraulic fracturing, was detected 73% of the time; several times in high concentrations," including one reading of 1730 ppbv.[32] Methylene chloride is stored on well pads and used for cleaning purposes.

In addition, the study of Colorado gas wells found high levels of multiple NMHCs, which can be associated with adverse health effects, including potential effects to the endocrine system at very low concentrations.[33] NMHCs generally make up almost 18 percent of produced natural gas, and operations ultimately emit large amounts of these pollutants. Moreover, like VOCs and NO_X, NMHCs are ozone precursors.

Oil and gas operations can also emit hydrogen sulfide. The hydrogen sulfide is contained in natural gas, and may be emitted during all stages of operation, including exploration,

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[24] Sierra Club et al. (2011) Comments on New Source Performance Standards: Oil and Natural Gas Sector; Review and Proposed Rule for Subpart OOOO ("Sierra Club Comments") at 13.
[25] Brown, Heather (2011) Memorandum to Bruce Moore USEPA / OAQPS / SPPD re Compositon of Natural Gas for use in the the Oil and Natural Gas Sector Rulemaking. July 28 ("Brown Memo") at 3.
[26] McKenzie 2012; Food & Water Watch (2012) *The Case for a Ban on Fracking.*
[27] 42 U.S.C. § 7412(b).
[28] McKenzie 2012 at 2.
[29] *Id.*
[30] Colborn 2011.
[31] Colborn, Theo, *et al.* (2012) An exploratory study of air quality near natural gas operations. peer-reviewed and accepted for publication by *Human and Ecological Risk Assessment: An International Journal* (November 9, 2012) ("Colborn 2012")
[32] *Id.*
[33] Colborn 2012.

extraction, treatment and storage, transportation, and refining.[34] EPA has identified large parts of California –including the region at issue – as areas where natural gas tends to contain hydrogen sulfide.[35] Long-term exposure to hydrogen sulfide is linked to respiratory infections, eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches.[36]

Oil and gas operations release large amounts of methane.[37] Natural gas emissions are generally about 84 percent methane.[38] While the exact amount is not clear, EPA has estimated that "oil and gas systems are the largest human-made source of methane emissions and account for 37 percent of methane emissions in the United States or 3.8 percent of the total greenhouse gas emissions in the United States."[39] Methane leakage is a major problem in Southern California. A recent study of methane emissions in the Los Angeles Basin found that a startling 17 percent of total gas produced was leaked or vented to the atmosphere.[40]

Emissions of methane, one of the most potent greenhouse gases, are of great concern because they contribute significantly to climate change. Methane's global warming potential is approximately 34 times that of carbon dioxide over a 100-year time frame and 84 times that of CO_2 over a 20-year period.[41] Oil and gas development contributes to greenhouse gas emissions from the operations, refining, and end-use of the extracted oil or gas. Fracking increases these emissions because it extends the life of a well, and may facilitate oil development that is otherwise uneconomic.

Other pollutants released from oil and gas production also warm the climate. In particular, as noted above, oil and gas operations result in the emission of large amounts of NO_X and VOCs. Both of these pollutants are precursors of tropospheric ozone,[42] which is an important contributor to climate change.[43] Further, oil operations result in significant carbon dioxide emissions from the combustion of fossil fuels through the operation of engines or through flaring.[44]

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[34] Sierra Club Comments.
[35] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (1993) *Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas* (EPA - 453/R - 93 - 045), at III-68 (Oct. 1993) ("USEPA 1993").
[36] *Id* at i.
[37] Natural Resources Defense Council (2012) *Leaking Profits.*
[38] Brown Memo at 3; Power, Thomas (2005)*The Local Impacts of Natural Gas Development in Valle Vidal, New Mexico*, University of Montana.
[39] U.S. Environmental Protection Agency (2012) *Natural Gas STAR Program, Basic Information, Major Methane Emission Sources and Opportunities to Reduce Methane Emissions* ; *see also* Petron, Gabrielle, et al. (2012) Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study, *Journal of Geophysical Research* 117.
[40] Peischl, J. *et al.* (2013) Quantifying sources of methane using light alkanes in the Los Angeles basin, California.
[41] International Panel for Climate Change ("IPCC") Fifth Assessment Report: Climate Change 2013. Ch. 8, Table 8.7, pg. 8-58, available at http://www.climatechange2013.org/images/uploads/WGIAR5_WGI-12Doc2b_FinalDraft_Chapter08.pdf
[42] Earthworks (2006) *Oil and Gas Air Pollution Factsheet.* available at: http://www.earthworksaction.org/library/detail/oil_and_gas_pollution_fact_sheet/.
[43] Shindell 2009.
[44] Zahniser, Angela (2007) *Characterization of Greenhouse Gas Emissions Involved in Oil and Gas Exploration and Production Operations.*

Also, the refining and burning of any oil or gas produced by fracking will generate greenhouse gas emissions. In considering such emissions, it is important to note that the quality of oil and gas varies from place to place. For instance, while some formations yield light, sweet crude that among varieties of crude necessitates a relatively low energy input to refine, much of the oil produced in California is heavy oil that requires large energy inputs to produce and refine.[45]

The South Coast Air Quality Management District (SCAQMD) has identified several areas of new, dangerous and unregulated air emissions from fracking: the use of silica as a proppant, which causes the deadly disease silicosis, and the storage of fracking fluid once it comes back to the surface.[46] Preparation of the fluids used for well completion often involves onsite mixing of gravel or proppants with fluid, a process that potentially results in major amounts of particulate matter emissions.[47] Further, these proppants often include silica, which increases the risk of lung disease and silicosis when inhaled.[48] Finally, as flowback returns to the surface and is deposited in pits or tanks that are open to the atmosphere, there is the potential for organic compounds and toxic air pollutants to be emitted, which are harmful to human health as described above.[49] Air pollution caused by fracking has been shown to contribute to health problems in people living near natural-gas drilling sites.[50]

New information about the increased air pollution associated with fracking triggers the need for supplemental environmental review. Additionally, there is significant new information about climate change and ocean acidification that results from the contribution of offshore oil and gas activities which must be considered.

iv. Offshore fracking will increase vessel traffic and light pollution.

The activities associated with fracking and the prolonged lifetime of oil and gas platforms as a result of new unconventional oil extraction methods will result in increases in vessel traffic and light pollution that in turn have adverse impacts on marine mammals and seabirds, respectively.

Offshore fracking is likely to increase vessel traffic and its associated impacts because vessels will be needed to service the wells, transport fracking fluids and sands, and dispose of wastes generated during the process. It may also increase vessel traffic as a result of extending the life of oil and gas operations and increasing interest in oil development in Pacific waters. Vessel traffic increases noise pollution that may interfere with important biological functions of marine mammals like feeding, mating, and rearing young. It also increases the risk of collisions with whales and sea turtles.

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[45] California Environmental Protection Agency Air Resource Board (2011) Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Low Carbon Fuel Standard, Appendix C, Calculation of Baseline Crude Average Carbon Intensity Value at C-5.
[46] SCAQMD Revised Draft Staff Report PR1148-2 at 15.
[47] *Id.*
[48] South Coast Air Quality Management District, Submission to Joint Senate Hearing (2013) at 3.
[49] SCAQMD Revised Draft Staff Report PR1148-2 at 15.
[50] McKenzie 2012.

Ship strike-related mortality is a documented threat to endangered Pacific coast populations of fin, humpback, blue, sperm, and killer whales. Ship strikes are an increasing problem in California.[51] Between 2001 and 2010, nearly 50 large whales off the California coast were documented as having been struck by ships.[52] The Santa Barbara Channel is important blue whale habitat. Between June and November, high densities of endangered blue whales spend time feeding on the abundant planktonic krill in the area of these oil and gas activities. In fact, blue whales have developed a particular affinity for the area such that the Santa Barbara Channel hosts the world's densest summer seasonal congregation of blues. Another endangered whale, the humpback whale, congregates in the area from May to September. Little is known about the elusive endangered fin whales; however, congregations have been observed near feeding aggravations of blue and humpback whales. Although rare, endangered sperm, right, and killer whales occasionally occur in the area. Gray whales migrate through the region in the late fall on their way south to breeding grounds and again in the late winter and early spring on their way north to feeding areas, and minke whales are known to occupy the region year-round. Increased oil and gas activities will interfere with important habitat and increase the risks of shipstrikes.

Fracking and other unconventional techniques extend the life of offshore oil and gas platforms with associated impacts from lighting to wildlife. Seabirds are vulnerable to disorientation from oil and gas operations that increase light pollution. Artificial lighting from the proposed action must be more fully evaluated. Artificial light attracts seabirds at night, especially nocturnally active species such as auks, shearwaters, and storm-petrels, and disrupts their normal foraging and breeding activities in several ways.[53] In a phenomenon called light entrapment, seabirds continually circle lights and flares on vessels and energy platforms, instead of foraging or visiting their nests, which can lead to exhaustion and mortality.[54] Seabirds also frequently collide with lights or structures around lights, causing injury or mortality, or strand on lighted platforms where they are vulnerable to injury, oiling or other feather contamination, and exhaustion.[55]

v. Fracking may risk increased seismic activity.

Scientists have long known that oil and gas activities are capable of triggering earthquakes, with records of the connection going back to the 1920s.[56] In California, oil and gas

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[51] Zito, Kelly (2010) Whale deaths blamed on busy ship traffic, krill. *San Francisco Chronicle,* Oct. 10.
[52] National Marine Fisheries Service, Large Whale Strandings Reported to California Marine Mammal Stranding Network (2001 - Present), NMFS Southwest Regional Office, Dalifornia Marine Mammal Stranding Network Database (2010)
[53] Montevecchi, W. (2005) Influences of artificial light on marine birds. In C. Rich and T. Longcore, editors. *Ecological Consequences of Artificial Night Lighting.* Washington, D.C: Island Press,. 94-113.
[54] Wiese, F. K., W. A. Montevecchi, G. K. Davoren, F. Huettmann, A. W. Diamond, and J. Linke (2001) Seabirds at risk around offshore oil platforms in the North-west Atlantic. *Marine Pollution Bulletin* 42:1285-1290. ("Wiese et al. 2001")
[55] Wiese et al. (2001); Black, A. (2005) Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. *Antarctic Science* 17:67-68.; Le Corre, M., A. Ollivier, S. Ribes, and P. Jouventin (2002) Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean). *Biological Conservation* 105:93-102.
[56] National Research Council (2012) *Induced Seismicity Potential in Energy Technologies* ("NRC 2012") at 3.

extraction has in the past likely induced strong earthquakes, including two over 6.0 in magnitude.[57] Recent studies have also drawn a strong connection between the recent rise in waste water injection and increased earthquake rates.[58] Waste water injection has likely been triggering seismic events in Ohio,[59] Oklahoma,[60] and Texas.[61] In addition, fracking has been found to contribute directly to seismic events,[62] and even if the earthquakes that fracking directly generates are small, fracking could be contributing to increased stress in faults that leaves those faults more susceptible to otherwise naturally triggered earthquakes of a greater magnitude.[63]

The evidence discussed above demonstrates that the threatened environmental damage from drilling on existing leases is far greater today than previously understood at the time the leases, exploration, and development and production plans were approved.

b. Hydraulic fracturing in the Pacific OCS triggers the need for a full EIS.

In addition to requiring supplemental NEPA review, fracking also warrants a full EIS because of the significance of its impacts. An analysis of the Council on Environmental Quality's (CEQ) NEPA regulations specify factors that must be considered in determining when an action may significantly affect the environment warranting an EIS. *See* 40 C.F.R. § 1508.27(b) (2007). Whether an action may have "significant" impacts on the environment is determined by considering the "context" and "intensity" of the action. 40 C.F.R. § 1508.27. "Context" means the significance of the project "must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality." Id. § 1508.27(a). Intensity of the action is determined by considering the following ten factors: (1) impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial; (2) the degree to which the proposed action affects public health or safety; (3) unique characteristics of the geographic area such as proximity to ecologically critical areas; (4) the degree to which the effects on the quality of the human environment are likely to be highly controversial; (5) the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; (6) the degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration; (7) whether the action is related to other actions with individually insignificant but cumulatively significant

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[57] NRC 2012 at 28.

[58] Van der Elst, Nicholas J., et al., Enhanced Remote Earthquake Triggering at Fluid-Injection Sites in the Midwestern United States, 341 Science 164 (2013) ("van der Elst 2013").

[59] Ohio Department of Natural Resources (2012) *Executive Summary: Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio, Area* ("Ohio DNR Northstar"); Fountain, Henry, Disposal halted at well after new quake in Ohio, *New York Times*, January 1.

[60] Keranen, Katie M. et al., Potentially induced earthquakes in Oklahoma, USA: Links between wastewater injection and the 2011 M w 5.7 earthquake sequence, Geology doi: 10.1130/G34045.1 (Mar. 26, 2013) ("Keranen 2013"); Holland, Austin, (2011) Examination of possibly induced seismicity from hydraulic fracturing in the Eola Field, Garvin County, Oklahoma, Oklahoma Geological Survey Open-File Report OF1-2011 ("Holland").

[61] Frohlich, Cliff, (2012) Two-year survey comparing earthquake activity and injection-well locations in the Barnett Shale, Texas. Proceedings of the National Academy of Sciences.

[62] BC Oil and Gas Commission, Investigation of Observed Seismicity in the Horn River Basin (2012) ("BC Oil 2012").

[63] *See* van der Elst (2013).

impacts; (8) the degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources; (9) the degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the federal Endangered Species Act; (10) whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. 40 C.F.R. § 1508.27(b)(1)-(10).

Several of the significance criteria are triggered here (public health, proximity to ecologically critical areas, presence of controversy, uncertain and unique risks, endangered species impacts), indicating that an EIS must be prepared and any attempt to rely on a categorical exclusion is clearly unlawful. Fracking poses a risk to public health and safety in a number of ways. *See* 40 C.F.R. § 1508.27(b)(2). As noted above, fracking fluids contain known carcinogens, air emissions contain toxic substances, and fracking can increase the risk of seismicity.

Fracking also poses a risk to a "unique . . . geographic area," containing "ecologically critical areas." *See* 40 C.F.R. § 1508.27(b)(3). Offshore platforms where fracking has occurred and may continue in the future are in the vicinity of the Channel Islands Marine Sanctuary and Channel Islands National Park. "Located offshore from Santa Barbara and Ventura counties in southern California, the Sanctuary hosts a rich and diverse range of marine life and habitats, unique and productive oceanographic processes and ecosystems, and culturally significant resources."[64] The Channel Islands National Park was established "to protect nationally significant natural, scenic, wildlife, marine, ecological, archaeological, cultural, and scientific values of the Channel Islands."[65] The potential for fracking to impact these unique areas requires consideration in a full EIS. Moreover, the area where the fracking is occurring is in endangered species habitat and water quality impacts specific to fracking may affect protected species. *See* 40 C.F.R. § 1508.27(b)(9).

In addition, fracking is a highly controversial practice. *See* 40 C.F.R. § 1508.27(b)(4). Recently, California legislators have called for an investigation into the practice.[66] The California Coastal Commission has launched its own investigation into offshore fracking.[67] Uncertainty about the chemicals used and the effects of fracking, especially offshore make the environmental impacts highly uncertain and involve unknown risks. *See* 40 C.F.R. § 1508.27(b)(5).

The Ninth Circuit has found that any "one of these factors may be sufficient to require preparation of an EIS in appropriate circumstances." *Ocean Advocates*, 402 F.3d at 865; *see also Nat'l Parks & Conservation Ass'n*, 241 F.3d at 731. Given the number of significance criteria

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[64] NOAA (2008) Channel Islands National Marine Sanctuary Final Management Plan/ Final Environmental Impact Statement at iii.

[65] 16 U.S.C. § 410ff.

[66] McGreevy, Patrick (2013) California lawmakers call for review of offshore fracking, Los Angeles Times (Aug 7, 2013) http://touch.latimes.com/#section/-1/article/p2p-76932884/http://touch.latimes.com/#section/-1/article/p2p-76932884/

[67] Associated Press (2013) California coastal panel takes up offshore fracking (Aug 15, 2013), http://abcnews.go.com/m/story?id=19965597&sid=81

fracking implicates, the agencies clearly must conduct a full environmental impact statement to consider the impact of this practice offshore.

However, it appears that APDs and applications to modify permits to drill are being approved without preparation of an Environmental Assessment or EIS under a categorical exclusion, and subsequently fracked. 516 DM 15.4 C(12). The Bureaus may not lawfully approve fracking under a categorical exclusion, as fracking an oil or gas well in the ocean has clear and obvious environmental impacts necessitating preparation of an EIS as discussed *supra*. Moreover, even if an approval for a fracked well could otherwise be shoehorned into a category eligible for a categorical exclusion, fracking is an extraordinary circumstance for which a categorical exclusion is not available. As required by NEPA regulations, 40 C.F.R. § 1508.4, the Department of Interior has identified "extraordinary circumstances" in which categorical exclusions may not be used. *See* 516 DM 2, Appendix 2. The identified circumstances include all of the significance criteria included in NEPA regulations including the presence of endangered species, proximity to a unique area containing ecologically critical areas, presence of a threat to health or human safety, the controversial nature of the project and the presence of uncertainty. Accordingly, APDs require NEPA analysis and a full, thorough EIS that will inform decisiomaking and allow a full public vetting.

2. Fracking Should Be Suspended Until the Bureaus Have Complied With all Legal Duties.

Permits that involve fracking should be suspended pending environmental compliance. The Outer Continental Shelf Lands Act (OCSLA) provides for development of offshore resources "subject to environmental safeguards . . . . " 42 U.S.C. § 1332(3). The Bureaus are required to"[p]revent damage to or waste of any natural resource, property, or the environment," 30 C.F.R. 250.301, and have the authority to suspend "any operation or activity, including production, pursuant to any lease or permit . . . if there is a threat of serious, irreparable, or immediate harm or damage to life (including fish and other aquatic life), to property,. . . or to the marine, coastal, or human environment" 43 U.S.C. 1334 (a)(1)(B); 30 C.F.R. § 250.172. When a lease is suspended due to potential threats of harm, BOEM may require the lessee to conduct a site-specific study and may use the study "to determine any actions that [the lessee must] take to mitigate or avoid any damage to the environment, life, or property." 30 C.F.R. § 250.177(a)(6)(ii). As discussed above, offshore fracking and other unconventional extraction techniques pose such a threat and, therefore, should be suspended and subjected to further analysis.

Further the Bureaus have an obligation under OCSLA to "consider available relevant environmental information in making decisions (including those relating to exploration plans . . .) . . . ." 43 U.S.C. § 1346(d). This statutory requirement demands that the Bureaus adequately consider all relevant available environmental information prepared pursuant to Section 20 of OCSLA. See H.R. Rep. No. 95-590, at 155 (1977) reprinted in 1978 U.S.C.C.A.N. 1450, 1561 ("Finally, the committee made it explicit that information prepared pursuant to this section should be adequately considered by the Secretary. In making decisions, . . . he is to review, analyze and consider all available and relevant environmental information prepared pursuant to this section."). To fulfill this obligation BOEM and BSEE must collect and analyze new

available information about the impacts of fracking before permitting any further such operations.

After further studying the impacts of fracking on the marine environment, the Bureaus should prohibit or condition fracking operations to reduce the risk to the environment. OCSLA regulations explicitly recognize that "[i]f MMS grants or directs a suspension under paragraph § 250.172(b), the Regional Supervisor may require [the lessee] to: (c) Submit a revised Development and Production Plan (including any required mitigating measures) . . . ." 30 C.F.R. § 250.177(b).

In addition to NEPA and OCSLA, fracking permits may trigger the requirements of other laws including the National Marine Sanctuaries Act, 16 U.S.C. § 1431 *et seq.*, and the Coastal Zone Management Act,16 U.S.C. § 1451 *et seq.* Among the purposes of the Sanctuary Act are "to maintain the natural biological communities in the national marine sanctuaries, and to protect, and, where appropriate, restore and enhance natural habitats, populations, and ecological processes." 16 U.S.C. § 1431(b)(3). To achieve these purposes, the Act requires that "Federal agency actions internal or external to a national marine sanctuary, including private activities authorized by licenses, leases, or *permits*, that are likely to destroy, cause the loss of, or injure any sanctuary resource are subject to consultation with the Secretary." 16 U.S.C. § 1434(d)(1)(A) (emphasis added). This consultation provision requires the agency proposing the action to provide a written statement describing the action and the potential effects on sanctuary resources no later than 45 days before the final approval of the proposed action. 16 U.S.C. § 1434(d)(1)(B). The action agency must follow the recommendations of the Secretary to avoid injury to any sanctuary resource or otherwise act to prevent and mitigate damage to such resources. 16 U.S.C. §§ 1434(d)(2), 1434(d)(3) & 1434(d)(4). The Pacific offshore oil and gas leases are in the proximity of the Channel Islands National Marine Sanctuary. Fracking and its associated practices can and will affect marine life that are resources protected by the sanctuary designation. The proposal could "destroy, cause the loss, or injure" these resources. We are unaware of any action by the Bureaus to comply with either the consultation provision of the NMSA or its substantive requirements. Absent such compliance, permits cannot lawfully be issued.

The Bureaus must also comply with the mandates of the Coastal Zone Management Act and its regulations. That law requires that:

> [A]ny applicant for a required Federal license or permit to conduct an activity, in or outside of the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide in the application to the licensing or permitting agency a certification that the proposed activity complies with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program. At the same time, the applicant shall furnish to the state or its designated agency a copy of the certification, with all necessary information and data.

16 U.S.C. § 1456(c)(3)(A).

The permits with fracking involved affect coastal resources and thus must be fully vetted by the California Coastal Commission. We are also concerned about the lack of transparency in the Pacific Region. Not only has the public been unaware of this practice, the California Coastal Commission was unaware that fracking was taking place offshore until very recently.[68] In contrast, both the Gulf of Mexico Region and Alaska Region make OCS documents including APDs, plans, and NEPA documents available to the public online. The Pacific Region, however, has little information available online and has required interested parties to use the Freedom of Information Act to obtain documents. This lack of transparency is a cause for concern. In fact, the Coastal Commission's lack of awareness about fracking raises serious questions about whether the Coastal Zone Management Act's requirements are being met. *See* 15 U.S.C. 930.54(a)(2) (providing federal agency's notice to states "shall contain sufficient information for the State agency to learn of the activity, determine the activity's geographic location, and determine whether coastal effects are reasonably foreseeable.")

* * *

In conclusion, the introduction of fracking into the offshore environment poses significant risks to important offshore habitats and threatens many species, including ESA listed species. For this reason, we are asking the Bureaus to suspend all fracking in the Pacific Region and conduct a full NEPA process and ensure compliance with other environmental laws to further examine the risks associated with this controversial process.

Sincerely,

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[68] Timm Herdt, Coastal Commission says it will investigate offshore fracking, VCstar.com (Aug. 15, 2013) http://www.vcstar.com/news/2013/aug/15/coastal-commission-says-it-will-investigate/?partner=RSS

List of References

American Petroleum Institute, Offshore Hydraulic Fracturing (2013)

Associated Press staff writer, Calif. Coastal Panel takes up Offshore Fracking (Aug 15, 2013), available at http://abcnews.go.com/m/story?id=19965597&sid=81

Bamberger, Michelle and Robert E. Oswald, Impacts of Gas Drilling on Human and Animal Health, 22 New Solutions 1 (2012)

BC Oil and Gas Commission, Investigation of observed seismicity in the Horn River Basin (2012)

Black, A., Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. 17 Antarctic Science 67 (2005)

Brown, Heather, Memorandum to Bruce Moore, USEPA/OAQPS/SPPD re Composition of Natural Gas for Use in the Oil and Natural Gas Sector Rulemaking (July 28, 2011)

California Environmental Protection Agency, Air Resources Board, Appendix C, Calculation of Baseline Crude Average Carbon Intensity Value (nd) of Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Low Carbon Fuel Standard (2011)

Center for Biological Diversity, Dirty Dozen: The 12 most commonly used air toxics in unconventional oil development in the Los Angeles Basin (2013)

CITI, Resurging North American Oil Production and the Death of the Peak Oil Hypothesis (2012)

Colborn, Theo et al., An exploratory study of air quality near natural gas operations, Human and Ecological Risk Assessment: An International Journal, DOI: 10.1080/10807039.2012.749447 (2013)

Colborn, Theo et al., Natural Gas Operations for a Public Health Perspective, 17 Human and Ecological Risk Assessment 1039 (2011)

DCOR, LLC, Application for Permit to Drill submitted to U.S. Department of the Interior Bureau of Safety and Environmental Enforcement (Apr 27, 2012)

Dearen, Jason, Offshore Fracking Off California Coast Under Review, Drawing Calls for Increased Regulation, Huffington Post (Oct. 1, 2013)

Earthworks, Oil and Gas Air Pollution Factsheet (2006)

E&E news staff writer, Proposed law would force drillers to test waste for radiation, E&E News Energywire (Feb 14, 2013)

Fontenot, Brian et al., An evaluation of water quality in private drinking water wells near natural gas extraction sites in the Barnett Shale Formation, Environ. Sci. Technol., DOI: 10.1021/es4011724 (published online July 25, 2013).

Food & Water Watch, The Case for a Ban on Fracking (2011)

Fountain, Henry, Disposal Halted at Well After New Quake in Ohio, New York Times (January 1, 2012)

Frohlich, Cliff, Two-year survey comparing earthquake activity and injection-well locations in the Barnett Shale, Texas, PNAS early edition www.pnas.org/cgi/doi/10.1073/pnas.1207728109 (2012)

Herdt, Timm, Coastal Commission says it will investigate offshore fracking, Ventura County Star (Aug 15, 2013)

Holland, Austin, Examination of possibly induced seismicity from hydraulic fracturing in the Eola Field, Garvin County, Oklahoma, Oklahoma Geological Survey Open-File Report OF1-2011 (2011).

Howarth, Robert, et al., Methane and the greenhouse-gas footprint of natural gas from shale formations, Climactic Change (Mar. 31, 2011).

Intergovernmental Panel on Climate Change, Chapter 8: Anthopogenic and Natural Radiative Forcing - Final Draft Underlying Scientific-Technical Assessment, Working Group I Contribution to the IPCC Fifth Assessment Report (AR5), Climate Change 2013: The Physical Science Basis (2013).

Keranen, Katie et al., Potentially induced earthquakes in Oklahoma, USA: Links between wastewater injection and the 2011 Mw5.7 earthquake sequence, Geology (March 26, 2013)

Le Corre, M., A. et al., Light-induced mortality of petrels: a 4-year study from Réunion Island (Indian Ocean), 105 Biological Conservation 93 (2002)

Mall, Amy, Natural Resources Defense Council, Petition for Rulemaking Pursuant to Section 6974(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Wastes Associated with the Exploration, Development, or Production of Crude Oil or Natural Gas or Geothermal Energy (2010).

McGreevy, Patrick, Californa lawmakers call for review of offshore fracking, Los Angeles Times (Oct 1, 2013).

McKenzie, Lisa et al., Human Health Risk Assessment of Air Emissions form Development of Unconventional Natural Gas Resources, Sci Total Environ (2012), doi:10.1016/j.scitotenv.2012.02.018

Massachusetts Institute of Technology, The Future of Natural Gas (2013)

Montevecchi, W., Influences of artificial light on marine birds, Chapter 5: Ecological Consequences of Artificial Night Lighting, C. Rich and T. Longcore, eds., Washington, D.C: Island Press (2005)

National Research Council, Induced Seismicity Potential in Energy Technologies (2012), available at http://dels.nas.edu/Report/Induced-Seismicity-Potential-Energy-Technologies/13355

National Marine Fisheries Service, Large Whale Strandings Reported to California Marine Mammal Stranding Network (2001 - Present), NMFS Southwest Regional Office, Dalifornia Marine Mammal Stranding Network Database (2010)

National Oceanic Atmospheric Association, Channel Islands National Marine Sanctuary, Final Management Plan/ Final Environmental Impact Statement (Nov 2008)

Natural Resources Defense Council, Leaking Profits: the U.S. oil and gas industry can reduce pollution, conserve resources, and make money by preventing methane waste (2012)

Ohio Dept of Natural Resources, Executive Summary: Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown Ohio Area (March 2012), available at http://ohiodnr.com/downloads/northstar/UICExecSummary.pdf.

Orszag, Peter, Fracking Boom Could Finally Cap Myth of Peak Oil, Bloomberg (Jan 31, 2012)

Papoulias, Diana and Anthony L. Velasco, Histopathological Analysis of Fish from Acorn Fork Creek, Kentucky, Exposed to Hydraulic Fracturing Fluid Releases, 12 Southeastern Naturalist (Special Issue 4) (2013)

Peischl, J. et al., Quantifying Sources of Methane using light alkanes in the Los Angeles basin, California, Journal of Geophysical Research: Atmospheres 118 (2013).

Pennsylvania Fish & Boat Commission, Ongoing problems with the Susquehanna River Smallmouth Bass: A case for Impairment (May 23, 2012).

Petron, Gabrielle et al., Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study, 117 Journal of Geophysical Research DO4304 (2012)

Piette, Betsey, BP oil spill, fracking cause wildlife abnormalities, Workers World, http://www.workers.org/2012/us/bp_oil_spill_fracking_0503/ (Apr 27, 2012)

Power, Thomas, The Local Impacts of Natural Gas Development in Valle Vidal, New Mexico, University of Montana (2005).

Shindell, Drew et al., Improved Attribution of Climate Forcing to Emissions, 326 Science 716 (2009).

Sierra Club comments on New Source Performance Standards: Oil and Natural Gas Sector Review and Proposed Rule for Subpart 0000 (Nov 30, 2011).

South Coast Air Quality Management District, Rule 1148.2 Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers, Adopted April 5, 2013.

South Coast Air Quality Management District, Submission to Joint Senate Hearing (2013)

U.S. Energy Information Administration, Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays (2011)

U. S. House of Representatives members Henry Waxman et al., Chemicals Used in Hydraulic Fracturing, U.S. House of Representatives Committee on Energy and Commerce Minority Staff Report (April 2011).

U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas (EPA - 453/R - 93 - 045), at i (Oct. 1993).

U.S. Environmental Protection Agency, Plan to Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (2011)

U.S. Environmental Protection Agency, Natural Gas STAR Program, Basic Information: Major Methane Emisssion Sources and Opportunities to Reduce Methane Emissions (2012).

U.S. Government Accountability Office, Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks, GAO 12-732 (September 2012).

Nicholas J. van der Est et al., Enhanced Remote Earthquake Triggering at Fluid-Injection Sites in the Midwestern United States, Science 341, 164 (2013)

Venoco, Inc., Application for Permit to Drill submitted to U.S. Department of the Interior Bureau of Safety and Environmental Enforcement (Nov 19, 2009).

Wiese, Francis et al., Seabirds at Risk around Offshore Oil Platforms in the North-west Atlantic, 42 Marine Pollution Bulletin 12 (2001)

Zahniser, Angela, Characterization of Greenhouse Gas Emissions Involved in Oil and Gas Exploration and Production Operations, Review for the California Air Resources Board (2007).

Zito, Kelly, Whale deaths blamed on busy ship traffic, krill, San Francisco Chronicle (Oct 10, 2010).